

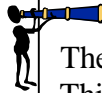
## Chapter 6

### Material Handling and Storage



#### Purpose:

Because every aspect of industry has elements of material handling and storage, more injuries occur in the handling of materials than in any other industrial activity. The property losses in storage areas are huge, both by fire and mechanical damage. This chapter describes precautions to be taken in an attempt to minimize and prevent the occurrence of these injuries and damages.



#### Scope:

There is considerable overlap between this and all other safety disciplines. This overlap will be reflected by many references to other parts of this manual. This approach shall not reduce the emphasis on these other safety aspects in “Material Handling and Storage” including:

- ❖ Warehousing
- ❖ Manual Handling
- ❖ Mechanical Handling
- ❖ Personal Protection
- ❖ References
- ❖ Related Chapters
- ❖ Attachments

For details see the Hanford Site Hoisting & Rigging Manual, # DOE-RL-92-36.



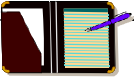
#### Warehousing:

##### 1. Fire Safety:

Warehouses and indoor storage areas shall be constructed and contents shall be stored according to NFPA 231, “General Storage” and NFPA 231 C, “Rack Storage of to assist compliance.

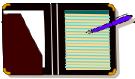
##### 2. Floor Loading:

The safe floor loading of every floor used as a work location or for storage of any kind, whether permanent or temporary, shall be determined by competent engineers. The “uniform Building Code” shall be the basic reference. The safe floor loading shall be conspicuously posted nearby or painted on the floor. This safe floor loading shall not be exceeded.



3. Docks and Ramps:
  - a) Docks and ramps shall be constructed to accepted engineering standards and shall be maintained in good condition. Surfaces shall be free from hazardous defects. Bridge plates, when used, shall be positively secured to prevent slipping. Powered dock boards shall be operated and maintained according to manufacturers' instructions.
  - b) Access from both outside and inside shall be free from obstruction.
  - c) Docks and ramps shall be equipped with side rails (perhaps removable) and protection from the weather, where practical..
  - d) Trucks, trailers, and rail cars while loading or unloading shall have brakes set and wheels chocked.
4. Access and Aisles:
  - a) Adequate safe access to all stored materials shall be maintained. The provisions of NFPA 231 and NFPA 231 C Shall apply with respect to fire protection.
  - b) Indoor, aisles shall be conspicuously marked and shall remain clear for free access.
  - c) Aisles serving forklifts and other mechanical equipment shall be at least eight feet in width. Wider aisles may be required for larger or special equipment. Posts, curbs, etc., shall be used if necessary to prevent damage to racks and storage by the mechanical equipment.
  - d) Personnel access aisles between shelving shall be three feet wide unless a greater width is justified for safety or required by code.
  - e) Where personnel access to shelves more than five feet off the floor is required, walkways, rolling safety ladders, nonslip step stools, or mechanical equipment shall be used. Personnel shall not climb shelves, bins, pallets, etc.
5. Compatibility:

Careful consideration shall be given to the compatibility of items in storage. Materials shall be identified by type and shall be segregated by risk. In large storage facilities, specific areas shall be identified and barriers supplied to provide adequate separation.
6. Inside Storage:
  - a) Shelving shall be securely fastened to prevent falling or tipping. To prevent items from falling, shelves shall be lipped as deemed necessary. Shelving dimensions shall be as specified by NFPA 231 C.
  - b) Palletized and stacked items may be stored only as high as stability is assured and still maintain required clearance from structural members and sprinkler systems. Storage shall not

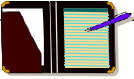


exceed 12 feet (normally, ordinary combustibles can be stored up to 12 feet in height and some forms of plastic will be limited to a 6 foot storage height; storage of plastic material, rubber tires, flammable liquids, etc. should be reviewed by a fire protection engineer) in height unless specialized fire protection is designed for the type of storage involved. All storage of high hazard materials such as plastics, tires, and flammable liquids must meet appropriate requirements set forth by a fire protection engineer. The engineer shall prepare an analysis, with appropriate technical review, of the conditions and protective measures.

- c) Hazardous materials shall be stacked only in accordance with appropriate technical review and approval of a Safety Analysis Report (SAR) or a thorough engineering evaluation. Consideration for effects and hazards posed by fire, seismic events, etc., shall be included in the technical review.
- d) Vertical clearance from overhead sprinkler heads shall be at least 18 inches and shall conform to NFPA 13 and NFPA 231. Clearance from fire doors, extinguishers, fire alarm cabinets, manual fire alarms, sprinkler valves and risers shall be sufficient to permit their proper operation and testing.
- e) Clearance from heating devices and flues shall be three feet unless a lesser clearance is permitted by the Underwriters' Laboratory approval. Clearance from ducts shall be as required by NFPA 91.
- f) At least one foot clearance from lights and light fixtures shall be maintained, both horizontally and downward.
- g) Fueled vehicles shall not be parked or stored inside storage or warehouse facilities except under conditions and procedures specifically approved by the responsible safety authority.

**7. Outside Storage:**

- a) Outside storage shall be within the requirements of Appendix C of NFPA 231. Materials subject to weather damage may be covered with noncombustible protective sheeting or other means
- b) Access shall not require undue risks to workers or property. Materials, if stacked or piled, shall be stable with no foreseeable risk of falling or toppling.
- c) Surface shall be reasonably level and free from risk to both foot and vehicle travel.
- d) Reasonable precautions against unauthorized access shall be taken with pilferage, injury, fire, and property damage all considered.



8. Flammable and Combustible Liquids and Gases:

Fuels, lubricants, flammable solvents, etc., stored and dispensed in bulk shall be stored and handled in accord with applicable NFPA codes ( in particular NFPA 30).

9. Housekeeping :

- a) Housekeeping in all its aspects is most important to safety in materials handling and storage.
- b) Working space and aisles shall be kept free of clutter. Packing materials shall be safely disposed of promptly (at least daily). Orderly arrangements of tools and working materials shall have the same attention as materials in storage.
- c) Outside grass, weeds windblown trash, etc., shall not be permitted to accumulate within 15 feet of buildings or equipment.



**Manual Handling:**

When materials are to be moved by hand, precautions shall be taken to provide the maximum safety to the individual.

1. Training:

Workers shall be taught the proper ways to lift and carry and the limits to individual lifting. Workers regularly employed in materials handling shall be made familiar with the safety provisions in this chapter and the pertinent references.

2. Work Space:

The workspace shall be adequate to permit proper positioning and movement without undue strain.

3. Physical Hazards:

The work place shall be kept free of physical hazards. Good housekeeping shall be maintained to prevent slipping, tripping, etc. Unnecessary sharp projections shall be eliminated or guarded.

4. Stacking:

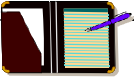
Piling and stacking shall be limited to reasonable heights. Piles and stacks shall be stable and shall be in accordance with fire protection and applicable hazardous material storing requirements.



**Mechanical Handling:**

1. Training:

Materials handling and storage workers shall be trained in the safe use of all mechanical aids with which they are supplied. This training shall include hand tools, carts of all types lifting devices not included elsewhere, etc.



2. Lift Trucks:

Lift truck operators shall be specifically trained and certified in the safe operation of their assigned equipment. The equipment shall be operated accordingly. The training and certification program shall be in writing and approved by the responsible local safety authority. See 29 CFR 1910.178 and Hanford Site Hoisting & Rigging Manual, Chapter 6.0 (Fork Lift Trucks) and Chapter 4.0 (Training and Qualifications).

3. Hoists:

Workers using mechanical hoisting devices of all types shall be trained and certified as required. See the Hanford Site Hoisting & Rigging Manual, Chapter 12 for detailed requirements.

4. Vehicles:

- a) Vehicle operations shall be within the requirement of the state of Washington. In addition, vehicle operators also engaged in material handling shall be familiar with the safety requirements of this Subpart.
- b) Vehicles must be of a type approved for the storage area in which they are used, e.g., only certain types may be used in flammable liquid storage areas.
- c) Operators of vehicles equipped with accessory mechanical devices such as chain hoists, hydraulic tailgates, etc., shall be specifically trained in the safe operation of these devices.
- d) In storage areas, vehicle engines shall not be left running while unattended.
- e) Liquid fueled vehicles shall always be refueled outside. See the Hanford Site Hoisting & Rigging Manual, Chapter 4 for additional vehicle requirements.



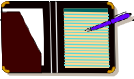
**Personal Protection:**

1. Head:

- a) Material handling often involves overhead work and/or the lifting of materials to considerable heights. On Jobs and in areas where a risk of head injury is present, hard hats shall be supplied and worn.
- b) Fork lifts used in lifting items to shelves racks, stacks, etc., shall be equipped with overhead guards.

2. Hands and Forearms:

Material handling always involves risks to hands and forearms from cuts, scratches, contusions, irritations, etc. Many such injuries are quite serious. Therefore, whenever manual handling involves such



risks, good quality gloves shall be worn and sleeves shall adequately protect the forearms.

3. Feet and Legs:

Where a risk of foot and/or leg injury exists (generally when heavy materials are being handled), the foot, and if indicated, the lower leg shall be protected. Safety shoes are usually sufficient, but some jobs may require additional protection for the ankle and lower leg.

4. Eyes and face:

The eyes and face shall be protected by appropriate use of safety glasses, goggles, face shields, etc. These are particularly important in the handling of chemicals, dusty materials, etc.

5. Other:

Occasionally, other protective items, such as respirators, rubber clothing hearing protective devices, etc., are required. The supervisor is responsible to identify these hazards, provide the equipment and assure its use. Assistance of safety professionals should be obtained on unusual problems.



**References:**

- ❖ 29 CFR 1910.178, "Powered Industrial Trucks."
- ❖ 29 CFR 1926, Applicable Sections On Hoisting & Rigging.
- ❖ DOE Order 5480.1, Chapter VIII, "Fire Protection."
- ❖ DOE-RL-92-36, "Hanford Site Hoisting & Rigging Manual"
- ❖ DOE-STD-1090-96, "DOE Hoisting & Rigging Manual."
- ❖ NFPA 13 "Standard for the Installation of Sprinkler Systems."
- ❖ NFPA 231 "General Storage," including Appendix C, "Protection of Outdoor Storage."
- ❖ NFPA 231 C "Rack Storage of Material."
- ❖ NFPA 30 "Flammable and Combustible Liquids Code."
- ❖ NFPA 58 "Liquefied Petroleum Gases, Storage and Handling."
- ❖ NFPA 385 "Tank Vehicles for Flammable and Combustible Liquids."
- ❖ ANSI MH Series "Materials Handling."
- ❖ ANSI Y 15.3 "Materials Handling and Flow Charts."
- ❖ ANSI B56.2 "Powered Industrial Trucks."



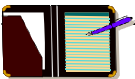
**Related Chapters:**

- ❖ Chapter 7, "Hoisting & Rigging."
- ❖ Chapters 13-14, "Industrial Fire Protection."



**Attachments:**

- ❖ Attachment 1: *Manual and Mechanical Handling Training Records*



**Attachment 1:**  
*Manual and Mechanical Handling Training Records*



Please insert a copy of applicable training records following this page or indicate the location of these records on the form below.

<b>Facility Name:</b>		
<b>Training Records Location:</b>	<b>Initial:</b>	<b>Date:</b>